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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/087,556	03/01/2002	Katsumi Yamaguchi	TI-31471	2191

23494 7590 11/28/2003

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EXAMINER

IM, JUNGHWA M

ART UNIT PAPER NUMBER

2811

DATE MAILED: 11/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/087,556

Applicant(s)

YAMAGUCHI ET AL.

Examiner

Junghwa M. Im

Art Unit

2811

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) _____ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 9-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

In view of the appeal brief filed on September 22, 2003, PROSECUTION IS HEREBY REOPENED. A new ground rejection is set forth below.

Prosecution is being reopened to reduce issues for appeal and to address the limitation of Claim 2 based on the Kanda et al. reference.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Claims 1, 3-6, 9, 11, 12 and 18-22 are rejected under 35 U.S.C. 102(e) as being anticipated by Kanda et al. (US 6,153,938), hereafter Kanda.

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Regarding claims 1 and 3-6, Fig. 1C of Kanda shows a semiconductor device comprising: a contact pad (col. 6, lines 15-18) on a semiconductor substrate 1, a conductive gold bump 2 (col. 5, line 43) on the contact pad, the bump comprising a coaxially-aligned circular bodies having different cross-sectional dimensions, said bodies at the top of said stack having smaller cross-sectional dimensions.

Regarding claim 9, Fig. 1C of Kanda shows bodies at the top of said stack have a smaller height than lower bodies in said stack.

Regarding claim 11, Fig. 1C of Kanda shows the semiconductor device further comprising a passivation film 9 around said contact pad.

Regarding claim 12, Fig. 1C of Kanda shows the sides of the contact pad is on an insulating film 9 on said semiconductor substrate.

Regarding claim 18, Fig. 1C of Kanda shows a semiconductor device, comprising:

a semiconductor substrate 1, a contact pad (col. 6, lines 15-18) on said semiconductor substrate; a first bump 2 on said contact pad; a smaller second bump on said first bump, said second bump coaxially aligned with said first bump and having a substantially flat peak plane; a printed circuit board 6, wherein said semiconductor substrate is mounted over said printed circuit board such that said contact pad and said first and second bumps are aligned with a conductive film 7 on said printed circuit board.

Limitations for claims 19-22 have been discussed above in claim 11, 9, 3 and 4 respectively.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kanda in view of Murakami (US 5,874,780).

Regarding claim 2, Kanda shows substantially the entire claimed structure except “the uppermost body in said stacked has a flat peak plane.” Fig. 7C of Murakami shows the uppermost body in the stack has a flat peak plane. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Murakami to of Kanda’s bump structure in order to form a flat top surface of the uppermost body to improve the contact between the chip and the corresponding substrate.

Claims 10, 12 and 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanda in view of Lin (US 6,426,556).

Regarding claims 10 and 12, Fig. 1C of Kanda shows substantially the entire claimed device except a barrier layer and an insulation layer. However, Fig. 15 of Lin shows a gold bump (35) formed on a contact pad (24) on an insulating film (29) on a substrate (10) with a barrier formation (33, 34) between the contact pad and the bump. See the respective portions of the specification such as col. 3, lines 11-28.

It would have been obvious to one of ordinary skill in the art at the time of the invention

to incorporate the teaching of Lin to the device of Kanda in order to form an barrier layer between a contact pad and a bump since a barrier layer between a contact pad and a bump serves to prevent diffusion of solder material into underlying layers. In addition, it would have been obvious to one of ordinary skill in the art at the time of the invention to add an insulating layer on a substrate of Kanda's device with Lin's teaching in order to alleviate a noise interference through the substrate to a conductive pad.

Regarding claim 13, Fig. 1C of shows Kanda a semiconductor device, comprising:

a contact pad (col. 6, lines 15-18) on a semiconductor substrate (1); a first bump (a larger one of 2) having a first cross-sectional dimension; a second bump on and coaxially aligned with said first bump, said second bump having a cross-sectional dimension smaller than said first cross-sectional dimension. However, Fig. 15 of Lin shows a gold bump (35) formation on a contact pad (24) with a barrier layer (33, 34) in between while a contact pad is formed on a dielectric layer (29) on a substrate (10).

Motivations for a barrier layer and an insulating layer have been discussed above.

Regarding claims 14-17, Fig. 1C of Kanda shows the semiconductor device further comprising a passivation film (9) around said contact pad, and two circular gold bumps(col. 5, line 43) while the height of the first bump is greater than the height of the second bump.

Response to Arguments

In view of the appeal brief filed on September 22, 2003, PROSECUTION IS HEREBY REOPENED. A new ground of rejection is set forth below.

The rejection over Murakami is withdrawn and a new rejection regarding claim 2 is made over Murakami and Kanda.

To avoid abandonment of the application, appellant must exercise one of the following two options:

- (1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,
- (2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

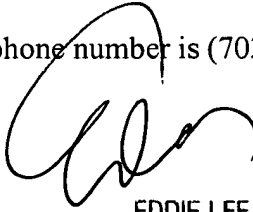
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (703) 305-3998. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on (703) 308-1690. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

jmi
November 18, 2003



EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800